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CCN activation and efficiency of nucleation and impaction removal process of biomass burning aerosols in Brazil: preliminary results.

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The biomass burning activity constitutes an important source of aerosols and trace gases to the atmosphere globally. In South America, during the dry season, aerosols prevenient from biomass burning are typically transported to long distances from its sources before being removed though contributing significantly to the aerosol budget on a continental scale. The uncertainties in the magnitude of the impacts on the hydrological cycle, the radiation budget and the biogeochemical cycles on a continental scale are still noteworthy. The still unknowns on the efficiency of biomass burning aerosol to act as cloud condensation nuclei (CCN) and the effectiveness of the nucleation and impaction scavenging mechanisms in removing them from the atmosphere contribute to such uncertainties. In the present work, the explicit modelling of the early stages of cloud development using a parcel model for the typical conditions of the dry season and dry-to-wet transition periods in Amazonia allowed an estimation of the efficiency of nucleation scavenging process and the ability of South American biomass burning aerosol to act as CCN. Additionally, the impaction scavenging was simulated for the same aerosol population following a method based on the widely used concept of the efficiency of collision between a raindrop and an aerosol particle. DMPS and H-TDMA data available in the literature for biomass burning aerosol population in the region indicated the presence of a nearly hydrophobic fraction (on average, with specific hygroscopic parameter κ=0.04, and relative abundance of 73 %) and nearly hygroscopic fraction (κ=0.13, 27 %), externally mixed. The hygroscopic parameters and relative abundances of each hygroscopic group, as well as the weighted average specific hygroscopic parameter for the entire population κ=0.06, were used in calculations of aerosol activation and population mass and number concentration scavenged by nucleation. Results from both groups of simulations are presented and discussed. This work provides an insight on the importance of the inclusion of these processes in regional/global models. The authors thank the Sao Paulo Research Foundation FAPESP for supporting this work through the projects DR 2012/09934-3 and BEPE-DR 2013/02101-9.